

COMMENTS ON DATA

The calculation of parameters for uranium rods is costly in both time and money if complete coverage is provided because of the number of variables involved. Different critical conditions may be obtained for different fuel materials, enrichments, rod diameters, water-to-uranium ratios, cladding material and cladding thickness.

Cladding fuel rods will generally tend to decrease critical limitations slightly for rods clad with materials such as aluminum or zirconium. For this reason, parameters in this section will be for unclad fuel. If it is desired to take advantage of the effect of a cladding, such as stainless steel which has a pronounced effect on critical limitations, it will be necessary to calculate this directly.

The uranium and uranium oxide data originally will be shown as the most limiting values for a given enrichment, i.e., for any rod diameter or lattice spacing. As time permits, more general curves showing variations with these parameters will be added.

The bulk of the uranium and uranium oxide data has been taken from work performed by H. K. Clark at the Savannah River Laboratory⁽¹⁾. This is a very elaborate work providing complete coverage of the effects of all the previously mentioned parameters on bare rods. A number of comparisons with this data has been made and these calculations appear to range from somewhat conservative at low enrichments to being the same at 5 wt.% U-235 enrichment. It does not appear necessary, therefore, to completely recalculate this data. Other calculations, less complete and slightly more conservative than those in DP-1014, may be found in AHSB(s), Handbook 1⁽²⁾.

Criticality parameters for materials other than uranium or uranium oxide have been calculated by the HAMMER code⁽³⁾. The calculations with this code compare favorably with the data in DP-1014. Calculations have been made with the original cross sections provided with the code (hereafter referred to as BNL cross sections) and with ENDF/B cross sections.

It is sometimes necessary to use a fixed value for the extrapolation distance, λ , with the buckling curves shown, either to reduce the complexity of the data or to insure against non-conservative calculations.

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- (1) H. K. Clark, "Maximum Safe Limits for Slightly Enriched Uranium and Uranium Oxide", DP-1014.
 - (2) J. H. Chalmers, et al, "Handbook of Criticality Data, Volume 1", AHSB(s) Handbook 1, (1st Revision), 1967.
 - (3) J. E. Suich and H. C. Honeck, "The HAMMER System", DP-1064, January, 1967.